

CLAIMS

What is claimed is:

1. A method of operating an external defibrillator that is configured to provide a defibrillation shock to a patient, comprising the steps of:

beginning to charge an energy storage device of the external defibrillator;

initiating a physiology analysis of the patient without human intervention after said beginning to charge said energy storage device; and

applying the defibrillation shock to the patient without human intervention after said initiating said physiological analysis of the patient.

2. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 1, further comprising the steps of:

determining a rate to charging an energy storage device based at least in part upon said physiology analysis; and

charging said energy storage device at said rate.

3. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 2, further comprising the steps of:

updating said rate to an updated rate to charging said energy storage device; and

charging said energy storage device at said updated rate.

4. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 1, further comprising the step of determining a physical parameter of the patient.

5. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 4, further comprising the step of determining a charging level to charge said energy storage device based at least partially upon said physical parameter.

6. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 4, wherein said physical parameter is a transthoracic impedance.

7. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 1, wherein said physiology analysis is a ElectroCardioGram (ECG).

8. The method of operating the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 1, further comprising the step of activating the external defibrillator prior to said beginning to charge said energy storage device.

9. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

begin to charge said energy storage device;

initiate a physiology analysis of the patient without human intervention after beginning to charge said energy storage device; and

apply the defibrillation shock to the patient without human intervention after initiating said physiological analysis of the patient.

10. The external defibrillator of claim 9, said controller further configured to:

determine a rate to charge said energy storage device of the external defibrillator based at least in part upon said a physiology analysis; and

charge said energy storage device at said rate.

11. The external defibrillator of claim 10, said controller further configured to:

update said rate to an updated rate to charge said energy storage device; and

charge said energy storage device at said updated rate.

12. The external defibrillator of claim 9, said controller further configured to determining a physical parameter of the patient.

13. The external defibrillator of claim 12, said controller further configured to determine a charging level to charge said energy storage device based at least partially upon said physical parameter.

14. The external defibrillator of claim 12, wherein said physical parameter is a transthoracic impedance.

15. The external defibrillator of claim 9, wherein said physiology analysis is a ElectroCardioGram (ECG).

16. The external defibrillator of claim 9, said controller further configured to activate prior to beginning to charge said energy storage device.

17. A method of charging an energy storage device of an external defibrillator that is configured to provide a defibrillation shock to a patient, comprising the steps of:

measuring a physical parameter of the patient at about a first time instant (t_1);

determining a charge for the energy storage device at about a second time instant (t_2) that is at least partially based on said physical parameter;

completing a physiology analysis of the patient at about a sixth time instant (t_6);

determining a rate for charging said energy storage device to substantially achieve said charge after about a fifth time instant (t_5) and before about a seventh time instant (t_7), said fifth time occurring before about said sixth time instant (t_6) and said seventh time instant (t_7) occurring after about said sixth time instant (t_6); and

beginning to charge said energy storage device at said rate at about a third time instant (t_3).

18. The method of charging the energy storage device of claim 17, further comprising the step of beginning said physiology analysis of the patient at about a fourth time instant (t_4).

19. The method of charging the energy storage device of claim 18, further comprising the step of activating said external defibrillator at an initial time instant (t_0).

20. The method of charging the energy storage device of claim 17, wherein said physical parameter is a transthoracic impedance.

21. The method of charging the energy storage device of claim 17, wherein said physiology analysis is an ElectroCardioGram (ECG) analysis.

22. The method of charging the energy storage device of claim 19, wherein said seventh time instant (t_7) is greater than said sixth time instant (t_6), said sixth time instant (t_6) is greater than said fifth time instant (t_5), said fifth time instant (t_5) is greater than said fourth time instant (t_4), said fourth time instant (t_4) is greater than said third time instant (t_3), said third time instant (t_3) is greater than said second time instant (t_2), said second time instant (t_2) is greater than said first time instant (t_1), and said first time instant (t_1) is greater than said initial time instant (t_0).

23. The method of charging the energy storage device of claim 19, wherein said fourth time instant (t_4) is substantially equal to said third time instant (t_3).

24. The method of charging the energy storage device of claim 17, wherein said fifth time instant (t_5) is within about two (2) seconds of said sixth time instant (t_6).

25. The method of charging the energy storage device of claim 17, wherein said seventh time instant (t_7) is within about two (2) seconds of said sixth time instant (t_6).

26. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

measure a physical parameter of the patient at about a first time instant (t_1);

determine a charge for the energy storage device at about a second time instant (t_2) that is at least partially based on said physical parameter;

complete a physiology analysis of the patient at about a sixth time instant (t_6);

determine a rate for charging said energy storage device to substantially achieve said charge after about a fifth time instant (t_5) and before about a seventh time instant (t_7), said fifth time occurring before about said sixth time instant (t_6) and said seventh time instant (t_7) occurring after about said sixth time instant (t_6); and

begin to charge said energy storage device at said rate at about a third time instant (t_3).

27. The external defibrillator of claim 26, said controller further configured to begin said physiology analysis at about a fourth time instant (t_4).

28. The external defibrillator of claim 27, said controller further configured to activate at an initial time instant (t_0).

29. The external defibrillator of claim 26, wherein said physical parameter is a transthoracic impedance.

30. The external defibrillator of claim 26, wherein said physiology analysis is an ECG analysis.

31. The external defibrillator of claim 28, wherein said seventh time instant (t_7) is greater than said sixth time instant (t_6), said sixth time instant (t_6) is greater than said fifth time instant (t_5), said fifth time instant (t_5) is greater than said fourth time instant (t_4), said fourth time instant (t_4) is greater than said third time instant (t_3), said third time instant (t_3) is greater than said second time instant (t_2), said second time instant (t_2) is greater than said first time instant (t_1), and said first time instant (t_1) is greater than said initial time instant (t_0).

32. The external defibrillator of claim 27, wherein said fourth time instant (t_4) is substantially equal to said third time instant (t_3).

33. The external defibrillator of claim 26, wherein said fifth time instant (t_5) is within about two (2) seconds of said sixth time instant (t_6).

34. The external defibrillator of claim 26, wherein said seventh time instant (t_7) is within about two (2) seconds of said sixth time instant (t_6).

35. A method of charging an energy storage device of an external defibrillator that is configured to provide a defibrillation shock to a patient, comprising the steps of:

initiating a physiology analysis of the patient at about a first time instant (t_1);

completing said physiology analysis of the patient at about a sixth time instant (t_6);

initiating a charge of said energy storage device at about a fourth time instant (t_4), said fourth time instant (t_4) occurring after said initiating said physiology analysis at about said first time instant (t_1) and before said completing said physiology analysis at about said sixth time instant (t_6); and

applying the defibrillation shock to the patient without human intervention at about a seventh time instant (t_7) occurring after said initiating said charge of said energy storage device at about said fourth time instant (t_4).

36. The method of charging the energy storage device of claim 35, further comprising:

measuring a physical parameter of the patient at about a first time instant (t_2);

determining a charge for the energy storage device at about a third time instant (t_3) that is at least partially based on said physical parameter; and

determining a rate for charging said energy storage device to substantially achieve said charge after about a fifth time instant (t_5) and before about said seventh time instant (t_7), said fifth time instant (t_5) occurring before about said sixth time instant (t_6) and said seventh time instant (t_7) occurring after about said sixth time instant (t_6).

37. The method of charging the energy storage device of claim 36, further comprising the step of activating said external defibrillator at an initial time instant (t_0).

38. The method of charging the energy storage device of claim 35, wherein said physical parameter is a transthoracic impedance.

39. The method of charging the energy storage device of claim 35, wherein said physiology analysis is a ECG analysis.

40. The method of charging the energy storage device of claim 37, wherein said seventh time instant (t_7) is greater than said sixth time instant (t_6), said sixth time instant (t_6) is greater than said fifth time instant (t_5), said fifth time instant (t_5) is greater than said fourth time instant (t_4), said fourth time instant (t_4) is greater than said third time instant (t_3), said third time instant (t_3) is greater than said second time instant (t_2), said second time instant (t_2) is greater than said first time instant (t_1), and said first time instant (t_1) is greater than said initial time instant (t_0).

41. The method of charging the energy storage device of claim 36, wherein said fifth time instant (t_5) is within about two (2) seconds of said sixth time instant (t_6).

42. The method of charging the energy storage device of claim 36, wherein said seventh time instant (t_7) is within about two (2) seconds of said sixth time instant (t_6).

43. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

initiate a physiology analysis of the patient at about a first time instant (t_1);

complete said physiology analysis of the patient at about a sixth time instant (t_6);

initiate a charge of said energy storage device at about a fourth time instant (t_4), said fourth time instant (t_4) occurring after initiating said physiology analysis at about said first time instant (t_1) and before completing said physiology analysis at about said sixth time instant (t_6); and

apply the defibrillation shock to the patient without human intervention at about a seventh time instant (t_7) occurring after said initiating said charge of said energy storage device at about said fourth time instant (t_4).

44. The external defibrillator of claim 43, said controller further configured to:

measure a physical parameter of the patient at about a first time instant (t_2);

determine a charge for the energy storage device at about a third time instant (t_3) that is at least partially based on said physical parameter; and

determine a rate for charging said energy storage device to substantially achieve said charge after about a fifth time instant (t_5) and before about said seventh time instant (t_7),

said fifth time instant (t_5) occurring before about said sixth time instant (t_6) and said seventh time instant (t_7) occurring after about said sixth time instant (t_6).

45. The external defibrillator of claim 44, further comprising the step of activating said external defibrillator at an initial time instant (t_0).

46. The external defibrillator of claim 44, wherein said physical parameter is a transthoracic impedance.

47. The external defibrillator of claim 43, wherein said physiology analysis is an ECG analysis.

48. The external defibrillator of claim 45, wherein said seventh time instant (t_7) is greater than said sixth time instant (t_6), said sixth time instant (t_6) is greater than said fifth time instant (t_5), said fifth time instant (t_5) is greater than said fourth time instant (t_4), said fourth time instant (t_4) is greater than said third time instant (t_3), said third time instant (t_3) is greater than said second time instant (t_2), said second time instant (t_2) is greater than said first time instant (t_1), and said first time instant (t_1) is greater than said initial time instant (t_0).

49. The external defibrillator of claim 44, wherein said fifth time instant (t_5) is within about two (2) seconds of said sixth time instant (t_6).

50. The external defibrillator of claim 44, wherein said seventh time instant (t_7) is within about two (2) seconds of said sixth time instant (t_6).

51. A method of charging an energy storage device of an external defibrillator that is configured to provide a defibrillation shock to a patient, comprising the steps of:

charging the energy storage device to a first charge level;

discharging the energy storage device from said first charge level to about a second charge level that is less than said first charge level; and

applying a defibrillation shock to the patient with a charge stored in the energy storage device at about the second charge level.

52. The method of charging the energy storage device of the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 51, further comprising the steps of:

measuring a physical parameter of the patient; and

determining the second charge level that is at least partially based on said physical parameter.

53. The method of charging the energy storage device of the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 52, wherein said measuring said physical parameter of the patient is conducted prior to said charging the energy storage device to said first charge level.

54. The method of charging the energy storage device of the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 51, further comprising the step of conducting a physiology analysis of the patient.

55. The method of charging the energy storage device of the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 51, further comprising the step of activating said external defibrillator.

56. The method of charging the energy storage device of the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 52, wherein said physical parameter is a transthoracic impedance.

57. The method of charging the energy storage device of the external defibrillator that is configured to provide the defibrillation shock to the patient of claim 54, wherein said physiology analysis is an ECG analysis.

58. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

charge the energy storage device to a first charge level;

discharge the energy storage device from said first charge level to about a second charge level that is less than said first charge level.

59. The external defibrillator of claim 58, said controller further configured to:

measure a physical parameter of the patient; and

determine a second charge for the energy storage device that is at least partially based on said physical parameter.

60. The external defibrillator of claim 59, said controller is further configured to measure said physical parameter of the patient prior to charging the energy storage device to said first charge level.

61. The external defibrillator of claim 58, said controller further configured to conduct a physiology analysis.

62. The external defibrillator of claim 58, wherein the external defibrillator is activated at an initial time instant (t_0).

63. The external defibrillator of Claim 59, wherein said physical parameter is a transthoracic impedance.

64. The external defibrillator of Claim 61, wherein said physiology analysis is an ECG analysis.

65. A method of charging an energy storage device of an external defibrillator that is configured to provide a subsequent defibrillation shock to a patient after an initial defibrillation shock is provided to the patient, comprising the steps of:

completing a physiology analysis of the patient; and

charging said energy storage device to substantially achieve a first charge used for said initial defibrillation shock before about said completing said physiology analysis of the patient.

66. The method of charging the energy storage device of the external defibrillator of claim 65, further comprising the steps of:

determining a rate for said charging said energy storage device to substantially achieve said first charge; and

charging said energy storage device at said rate.

67. The method of charging the energy storage device of Claim 65, wherein said physical parameter is a transthoracic impedance.

68. The method of charging the energy storage device of Claim 65, wherein said physiology analysis is an ECG analysis.

69. An external defibrillator that is configured to provide a subsequent defibrillation shock through a plurality of electrodes attached to a patient after an initial defibrillation shock is provided through the plurality of electrodes, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

complete a physiology analysis of the patient; and

charge said energy storage device to substantially achieve a first charge used for said initial defibrillation shock before about said competing said physiology analysis of the patient.

70. The external defibrillator of claim 69, said controller further configured to:

determine a rate to charge said energy storage device to substantially achieve said first charge; and

charge said energy storage device at said rate.

71. The external defibrillator of Claim 69, wherein said physiology analysis is an ECG analysis.

72. A method of operating an external defibrillator that is configured to provide a defibrillation shock to a patient, comprising the steps of:

sensing a first input for powering the external defibrillator;

initiating charging an energy storage device of the external defibrillator as a result of one of said sensing said first input and said powering the external defibrillator;;

receiving a firing input requesting delivery of the defibrillation shock; and

delivering the defibrillation shock in response to said receiving said firing input, said delivering the defibrillation shock occurring without the external defibrillator conducting a physiology analysis of the patient.

73. The method of operating the external defibrillator that is configured to provide a defibrillation shock to the patient of Claim 72, further comprising:

disabling said firing input while said charging said energy storage device of the external defibrillator;

sensing a preparatory input; and

enabling said firing input in response to said sensing said preparatory input.

74. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient upon one or more activations of an input, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes, said energy storage device and said input, said controller configured to:

sense a first input for powering the external defibrillator;

initiate charging an energy storage device of the external defibrillator as a result of one of sensing said first input and said powering the external defibrillator;

receive a firing input requesting delivery of the defibrillation shock; and

deliver the defibrillation shock in response to receiving said firing input, which occurs without the external defibrillator conducting a physiology analysis of the patient.

75. The external defibrillator of claim 74, wherein said controller is further configured to:

disable said firing input while charging said energy storage device of the external defibrillator;

sense a preparatory input; and

enable said firing input in response to sensing said preparatory input.

76. A method of operating an external defibrillator that is configured to provide an initial defibrillation shock and a subsequent defibrillation shock to the patient, comprising the steps of:

delivering an initial defibrillation shock;

beginning to charge an energy storage device of said external defibrillator as a result of said delivering the initial defibrillation shock and without human intervention; and

delivering the subsequent defibrillation shock.

77. The method of operating the external defibrillator that is configured to provide the initial defibrillation shock and the subsequent defibrillation shock to the patient of Claim 76, further comprising initiating a physiology analysis after said beginning to charge said energy storage device.

78. The method of operating the external defibrillator that is configured to provide the initial defibrillation shock and the subsequent defibrillation shock to the patient of Claim 76, wherein said delivering the subsequent defibrillation shock is conducted without human intervention.

79. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

deliver an initial defibrillation shock;

begin to charge an energy storage device of said external defibrillator as a result of delivering the initial defibrillation shock and without human intervention; and

deliver the subsequent defibrillation.

80. The external defibrillator that is configured to provide the defibrillation shock through the plurality of electrodes attached to the patient of Claim 79, wherein said processor is further configured to initiate a physiology analysis after said beginning to charge said energy storage device.

81. The external defibrillator that is configured to provide the defibrillation shock through the plurality of electrodes attached to the patient of Claim 79, wherein the processor is configured to deliver the subsequent defibrillation shock without human intervention.

82. A method of operating an external defibrillator that is configured to provide a defibrillation shock to a patient through a plurality of electrodes, comprising the steps of:

activating the external defibrillator;

sensing application of at least one of said plurality of electrodes to the patient;

initiating charging of the external defibrillator to achieve an energy level for at least one energy storage device of the external defibrillator; and

delivering the defibrillation shock to the patient through the plurality of electrodes.

83. An external defibrillator that is configured to provide a defibrillation shock through a plurality of electrodes attached to a patient, comprising:

a connection port configured to couple the external defibrillator to the plurality of electrodes;

an energy storage device coupled to said plurality of electrodes; and

a controller coupled to said plurality of electrodes and said energy storage device, said controller configured to:

sense application of at least one of the plurality of electrodes to the patient;

initiate charging of the external defibrillator to achieve an energy level for at least one energy storage device of the external defibrillator; and

deliver the defibrillation shock to the patient through the plurality of electrodes.